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Food & Nutrition

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Nutrition and Health

Researchers may be looking at the wrong organ for tumors promoted by radon gas—a radioactive decay product of uranium that exceeds recommended levels in some U.S. homes and buildings. New evidence shows the gas does not confine itself in the lungs as currently thought, but is circulated throughout the body and accumulates in the lower abdominal and upper head regions—where fatty tissues abound. This suggests the potential for tumors of the brain, breast and prostate in people who are chronically exposed to high radon levels. The findings bear out results of a 1957 study showing that rats stored radon gas in their fatty tissues. Epidemiological evidence does not support the notion that radon causes lung cancer in nonsmokers but indicates that it worsens the effects of other causes, such as smoking or mining. A new study, involving University of North Dakota researchers and health groups statewide, will look for a correlation between high radon levels and tumors in fatty tissues among North Dakota residents. More than 80 percent of the homes tested in the Grand Forks area had radon levels well above the Environmental Protection Agency's safe limit.

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A new single-celled parasite of animals and possibly people has surfaced. *Neospora* looks and behaves like *Toxoplasma*—the protozoan that infects farm animals, pets and people, causing abortions and birth defects. ARS scientists identified *Neospora* in dogs just a year ago and have since found it capable of infecting cats, mice, rats, cattle and sheep. They also have identified it as the cause of abortions and paralysis in cattle in Washington, New Mexico, Maryland and Australia. An ARS lab at Beltsville, Md., has the only diagnostic test for *Neospora* available. In animals, the parasite can pass directly from mother to fetus; other sources of infection are not yet known. Human infection with *Neospora* has not been studied, but scientists estimate that 40 percent of the U.S. population carries its look-alike cousin, *Toxoplasma*, which is transmitted via cat feces. The source of *Neospora* infection for animals is not known, but because of its similarity to *Toxoplasma* and its wide range of hosts, scientists are concerned that *Neospora* could infect humans.

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A large, Grade A egg actually has about 22 percent less cholesterol than previously thought, according to results of a nationwide study by USDA and the egg industry. On the average, cholesterol measured 213 milligrams per egg instead of the 274 mg last published by USDA in 1976. The analyses were done on egg composites representing over 60 percent of the nation's egg production. The cholesterol values were monitored throughout the study against an egg-cholesterol standard recently certified by the National Institute of Standards and Technology (formerly the National Bureau of Standards). The change in the cholesterol content is the result of improved analytical methods as well as careful quality control. Other factors that may have had an impact include changes in poultry feeding and management practices. The updated data will be included in a 1989 supplement to *Agriculture Handbook 8: Composition of Foods*—used widely by nutritionists, other health professionals and food scientists—that will be released later this year by USDA's Human Nutrition Information Service. Beltsville Human Nutrition Research Center, Beltsville, MD
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Dietary surveys and recent animal studies increasingly support the theory that too little copper may be at the root of heart disease. Ten dietary surveys indicate that 35 percent of Americans consume half or less of the current suggested

2-milligram copper intake per day. Recent ARS studies suggest the requirement may be lower. Nevertheless, nearly 50 similarities between copper-deficient animals and people with coronary heart disease have now been observed. Two new animal studies show that a copper-deficient diet combined with too much salt aggravates kidney failure, or with stress raises blood pressure. Rats fed a copper-deficient diet and 10 times as much salt as they require—quite common in human diets—lost all kidney function. The animals getting adequate copper were able to excrete the extra salt and fluid, which is important in maintaining normal blood pressure. In a second study, rats fed a copper-deficient diet and exposed to stress—confinement in a small cage for 45 minutes each day—developed higher blood pressure than the animals subjected to only one or none of the conditions. In both studies, survival rates of the doubly stressed animals were dramatically reduced.

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Diets high in simple sugars can drain your body of chromium—an essential element for regulating blood sugar levels. And few of us get enough chromium, which helps keep insulin levels in check by making the hormone more efficient at processing dietary glucose. A study of 20 men and women indicates that the more insulin we secrete to handle sugars from a meal, the more chromium we use and lose, because used chromium is excreted in the urine. And when body chromium is in short supply, we secrete more insulin. Chronically high insulin levels—an early warning sign for adult-onset diabetes—are probably due to low body stores of chromium. The study showed that the biggest rise in insulin levels and, consequently, the greatest loss of chromium result from eating glucose followed shortly by fructose—the two most common sugars in our diets. It's more important to conserve body chromium than to replace it because few foods provide more than 10 to 15 percent of the minimum suggested intake—50 micrograms (millionths of a gram) per day. A few breakfast cereals provide more than 25 percent; one tested cereal provides about 60 percent. Beer and wine are also good sources.

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Adding buckwheat to our diets—not just to pancakes—could help us cut calories and keep blood sugar at optimal levels, preliminary findings show. Buckwheat grain is digested more slowly than other carbohydrates. So a meal containing buckwheat leaves us feeling full longer, curbing the urge to snack or gorge at the next meal. Studies now show that its slow uptake also has the potential to prevent adult-onset diabetes and to improve glucose tolerance in those who have developed the disease. During 3-week studies, nine nondiabetic men and women ate meals with either buckwheat, rice or potato as the major carbohydrate.

And nine diabetics, three of whom used insulin daily, got buckwheat, brown rice or a soybean-white rice mixture. In all cases, the meals containing buckwheat produced the smallest increases in blood glucose and insulin, but had no effect on cholesterol or triglyceride levels. The studies were done in Korea—where buckwheat is a dietary staple—by a University of Oklahoma scientist now visiting ARS. *Beltsville Human Nutrition Research Center, Beltsville, MD
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Eggs aren't the only food having less cholesterol than previously thought. A whole day's meals may be lower. ARS scientists analyzed the cholesterol contents of samples of 60 days of meals, not of individual foods, by the most accurate method available—gas-liquid chromatography (GLC)—and by an older colorimetric method—the Zak method. Such colorimetric methods are now known to give erroneously high values because they measure all plant and animal sterols, not just cholesterol. Scientists also estimated cholesterol content of the daily 60 menus using the USDA food composition tables, where the values are often obtained by colorimetric as well as GLC analyses. GLC analysis yielded the lowest values, while the colorimetric method yielded the highest. Estimates from the USDA food tables fell in between. These findings indicate that cholesterol values in the food tables need to be reviewed and updated. But they should not be construed to justify increasing cholesterol intake.

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Rice bran—the thin brown layer that's milled off in processing the familiar white rice kernel—may prove to be a powerful cholesterol-fighter. Hamsters fed fiber-rich rice bran plus a high dose of pure cholesterol had cholesterol levels similar to hamsters fed cholesterol plus oat bran, another fiber source. Both groups' cholesterol levels were significantly lower than those of hamsters fed cholesterol plus cellulose, a fiber generally shown to have no cholesterol-lowering effects. To more rigorously test rice bran's beneficial effects, further ARS studies with hamsters are planned for this year. Products containing rice bran include brown rice, several snack foods and a topping made of light, naturally sweet bran flakes. ARS scientists have expanded bran's use in nutritious new foods by developing a process that stops bran's rich oil from turning rancid. Because of this natural deterioration, rice bran has been used primarily as a high protein ingredient in animal feed. An added benefit: In countries where rice is a staple, the process makes it more practical and economical to extract rice oil for refining into salad or cooking oil.

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Healthy nursing mothers in a recent study provided the same total fat and cholesterol for their infants regardless of how much fat they ate or how much milk they produced. Fat accounts for about half the calories in breast milk and is the nursing infant's major source of energy for the first few months. Although preliminary, the findings indicate that the breast controls its total fat output more closely than its sugar or protein output, contrary to current thinking. When the 11 mothers switched from a high-fat (40 percent) to a very low-fat (10 percent) diet, the percentages of fat and cholesterol in their milk dropped slightly. But their daily milk volume increased to keep total fat and cholesterol the same. The mothers who were selected for the study naturally produced either low-fat milk (less than 3 percent fat) or high-fat milk (more than 4 percent fat). Breast milk normally has 3.5 percent fat—about the same as most cow's milk—but can range from 1.5 to 6 percent for reasons unknown. Regardless of their diet, the "low-fat-milk" group produced 50 percent more milk by volume containing the same total fat as the "high-fat-milk" group. But it contained more lactose and protein—about 30 percent more calories worth—making it more nutritious.

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Tomorrow's Foods

It's light and bubbly, and tastes a little like champagne. But it's not champagne, it's muscadine grape juice. And now that scientists have developed new planting and growing practices, it may become more plentiful. Muscadines grow wild in the South and are the first American grapes to be cultivated. Working with the Mississippi Agriculture and Forestry Experiment Stations at Starkville and Crystal Springs, Miss., ARS researchers have developed management practices that increase yield and fruit quality without chemicals and with less labor. These new practices could produce a commercial crop in the third year—2 years faster than currently possible. A muscadine juice-processing plant was recently completed in Mississippi, with a satellite plant in North Carolina. Part-time farmers in the Southeastern U.S. and those looking for an alternative crop are showing increased interest in the muscadine.

*Small Fruit Research Station, Poplarville, MS
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An "eat-it-all" melon could be as handy a snack as an apple. Imagine a melon with an edible rind but no core or seeds left to throw away in a single serving size. As part of the project to create such a snack melon, two disease-resistant, cantaloupe-like melons with a smooth skin and firm flesh like an apple's have been developed. The more attractive of the two has a bright yellow rind, pink flesh and excellent quality, although the fruit is still too large to eat

as a snack like an apple. The other has high yields with 6 to 15 grapefruit-size melons per plant, but the sweet flesh is an unattractive off-white color. Bringing the size of each melon down to peach- or plum-size is not expected to be difficult, but breeding in seedlessness probably will be. Also planned is breeding for longer shelf life with an eye toward being able to market the melon in vending machines, such as those that currently offer apples and oranges. The finished variety, at least 2 or 3 years away, will almost certainly be some type of hybrid.

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Mt. Pulaski Products of central Illinois has been licensed to make a no-calorie, high-fiber flour from corn fiber. The flour can boost the fiber content of breads, cake mixes, pancakes, doughnuts, crackers and other prepared foods without affecting taste or adding calories. ARS scientists developed the process for more than 4 years before patenting it in 1988. The process softens the fibrous parts of corn cobs and other cereal crops so they can be made into flour. A dilute solution of hydrogen peroxide breaks down the lignin, or woody substance in these plant materials. Mt. Pulaski Products expects to sell the flour to companies that want to produce fiber-rich baked goods.

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A newly released orange hybrid is expected to help Florida growers and processors reduce U.S. dependence on imported juice. Juice from Ambersweet, the new orange hybrid, exceeds Federal color standards for Grade A juice. It can be mixed with other domestic orange juices that don't quite make the grade. This should help processors who must now import and store juice to mix with Hamlin and other orange varieties. Ambersweet, which matures earlier than most other varieties, is also ideal for the fresh market. Test-grown in two areas of Florida since 1974, it should be available from commercial nurseries within a year. U.S. orange juice imports totaled about \$535 million in 1987-88, mostly from Brazil.

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Food Freshness and Safety

Petunias—a distant relative of the tomato—contain natural insecticides that apparently help the plant fend off the destructive tomato fruitworm (*Heliothis zea*). When fed to fruitworms in lab tests, these natural chemicals from petunia leaves and stems killed young tomato fruitworm larvae and stunted the growth of older worms. Studies of two other tomato relatives, cape gooseberry and tomatillo, suggest that chemicals in these plants also may defend them from the fruitworm. The tools of modern biotechnology may make it possible for scientists to transfer genes for this natural resistance into tomatoes. Similarly, other crops attacked by the tomato fruitworm, such as potato, corn, cotton and soybean, might be protected.

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Alternatives to chemical pesticides will get a boost now that ARS and Russian scientists are working together to find, test and exchange biological controls. In May, scientists began exploring Moldavia, the Ukraine and the northern Caucasus for beneficial insects and microbes to thwart the Russian wheat aphid. The aphid cost U.S. wheat and barley growers about \$123 million in 1988. First found in the United States in Texas in 1986, it has spread to 15 states and Canada. When the aphid begins sucking sap from a wheat or barley leaf, the leaf rolls around it, protecting it from insecticides. This summer, five ARS researchers and one from the University of Idaho are scheduled to tour Russia in search of biocontrols for the aphids as well as grasshoppers and two serious U.S. range weeds, leafy spurge and knapweed.

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Edible coatings made from milk or other farm products could keep fresh fruits and vegetables firm, colorful, flavorful and nutritious longer than ever before. When fully developed, the safe-to-eat films would not alter the taste or texture of the foods they protect. Consumers who like fresh produce but don't want to spend time in the kitchen washing, slicing, peeling, pitting and paring could bring home and enjoy a healthful, ready-made salad bar for days. In tests, a nearly invisible coating that includes milk's major protein, casein, kept small pieces of sliced and peeled apple fresh and firm for several days. Unprotected pieces shriveled and turned brown within a few hours. A small amount of vitamin C can be added to the coating to further reduce browning. ARS scientists now want to tighten the molecular structure of the protein to block water's escape and yield a thinner film, work which may take about two years. Such films could also be made from the protein in soybean, corn or wheat.

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A friendly bacterium that helps stop mold-causing fungi on apples and pears has yielded a clue about its makeup. Researchers have discovered a new derivative of the bacterium's powerful natural antibiotic, pyrrolnitrin. Golden Delicious apples were punctured, exposed to three common rot-causing organisms and then treated with the new derivative—a phenylpyrrole. The compound completely stopped one fungus and reduced the other two by 80 percent each. By substituting a different broth for growing the bacterium, *Pseudomonas cepacia*, researchers increased yield of pyrrolnitrin by 50 times. Because it helps stop blue mold and gray mold in fruit, the bacterium might be used as a safe, effective alternative to fungicides to stop fruit from spoiling.

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Stored rice may one day be free of munching pests without the use of insecticides. Researchers have begun breeding a variety that naturally resists insects that attack rice in storage. Millions of dollars are spent annually fighting these infestations, and experts estimate there is still a 5- to 10-percent loss of stored rice each year. After screening several thousand varieties of rice in the USDA World Collection, three were selected as showing potential for resistance to the Angoumois grain moth, lesser grain borer, rice weevil, red flour beetle, and several *Cryptolestes* species. Interbreeding these varieties, all originating in Asia, for just three to five generations has already resulted in a rice that is far less suitable as a host for stored-rice-attacking insects, reducing insect infestation by 90 percent. The rice's resistance seems to come from having a hull that maintains its integrity rather than some biochemical difference. Researchers are adding in a cross with high-yielding commercial varieties to create elite germplasm with both excellent yield and storage-insect resistance.

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The Briefs is published quarterly in January, April, July and October. For further information or addition to the mailing list, contact Judy McBride, ARS Nutrition Editor at (301) 344-4095; or write me at ARS Information, Bldg. 005, BARC-West, Beltsville, MD 20705.